REMARKS

Claims 1, 6, 7, 12, 13, and 18-21 are currently being examined. Claims 1, 6, 7, 12, 13, and 18 have been amended. Claims 2-5, 8-11, and 14-17 have been canceled without prejudice or disclaimer of their subject matter. No new claims have been added. It is respectfully believed that no new matter has been introduced.

Applicants have enclosed herewith a Declaration under 37 CFR 1.132 to show that the present invention as set forth in claims 1, 7, and 13, as amended, provides remarkable effects over JP 2000-187326 (**Imai '326**) newly cited by the Examiner.

The enclosed Declaration was submitted under 37 CFR 1.132 after final rejection and with a first reply after final rejection for the purpose of overcoming a new ground of rejection or requirement made in the final rejection, or with a satisfactory showing under 37 CFR 1.116(b) or 37 CFR 1.195, or under 37 CFR 1.129(a).

The Final Office Action dated January 23, 2004 sets forth new grounds for rejection related to the newly cited JP 2000-187326 (**Imai '326**). The enclosed Declaration was submitted for the purpose of overcoming such new grounds of rejection. The enclosed Declaration addresses features of claims 1, 7, and 13, as amended, such as heat-fusible inorganic powder and calcining the conductive coating.

A.

Before turning to the cited art in detail, a brief review of the present invention is in order. The present invention a method of forming a conductive pattern, comprising the steps of: applying a positive thermosensitive paste composition containing a conductive powder **and a heat-fusible inorganic powder** to a substrate, followed by drying, to form a positive thermosensitive coating; irradiating the coating directly with infrared laser beam so as to obtain a desired pattern; removing the irradiated part of the coating by development to form a conductive pattern coating; and **calcining the conductive pattern coating.**

Claims 1, 7, and 13 have been amended to incorporate features set forth in claims 5, 11, and 17, respectively, to specify that the positive thermosensitive paste composition contains a heat-fusible inorganic powder and that calcination is employed after forming the conductive pattern coating.

Claims 6 and 19 depend from claim 1, as amended. Claims 12 and 20 depend from claim 7, as amended. Claims 18 and 21 depend from claim 13, as amended.

B.

In the method of the present invention, a positive thermosensitive coating is formed using a positive thermosensitive paste composition containing a conductive powder and a heat-fusible

inorganic powder, followed by irradiation with an infrared laser beam, development and calcination to give a conductive pattern coating.

In addition to the remarkable advantages described in the specification on page 42, line 1, to page 43, line 1, the method of the present invention provides such noteworthy effects as the following:

(i) sharply patterned coatings can be formed because infrared heat rays reach deep into the positive thermosensitive coating despite the presence of conductive powder in the coating; and

(ii) as evidenced in the enclosed Declaration, a patterned coating that strongly adheres to the substrate can be formed. Moreover, in the patterned coating, lines are well-remained and spaces are well-developed. The conductive pattern after calcination has a good line shape. Furthermore, the conductive pattern coating has excellent conductivity.

C.

On the contrary, the six references cited and relied upon by the Examiner, alone or in combination, fail to teach or suggest the above-described advantages and features of the present claimed invention.

The six references cited and relied upon by the Examiner are as follows.

Reference 1: JP 2000-277887 (**Kubota '887**)

Reference 2: JP 06-260381 (**Yamanaka '381**)

Reference 3: JP 11-194493 (**Kosaka '493**)

Reference 4: JP 10-334732 (**Masaki '732**)

Reference 5: JP 10-273338 (**Okino '338**))

Reference 6: JP 2000-187326 (**Imai '326**)

In any methods for forming patterns which may be disclosed in References 1 to 5, patterns are created by forming a coating using a positive or negative photosensitive conductive paste, and irradiating the coating with visible or ultraviolet (UV) light. It is difficult to form sharp patterns using visible or UV light because light rays do not reach deep into the coating due to the presence of the conductive powder therein.

The thermosensitive resist composition of Reference 6 is mainly used as an etching resist. It neither contains a conductive powder nor a heat-fusible inorganic powder. Furthermore, it is neither conductive nor in the form of a paste. The enclosed Declaration shows that when inventors tried to form patterns using the resist composition of Reference 6, the resist coating disappeared from the substrate due to calcination, failing to form patterns.

In view of the foregoing, it is apparent that References 1 to 6, alone or in combination, fail to describe, teach, or suggest the makeup of the claimed subject matter of the present invention and the remarkable effects thereof described in Sections "**A.**" and "**B.**" above and described in the enclosed Declaration. Therefore, the present invention as set forth in claims 1, 7, and 13, as amended, is not described, taught, or suggested by References 1 to 6, alone or in combination.

D.

Claims 7 and 13 stand rejected under 35 USC 103(a) as obvious over JP 2000-277887 (**Kubota '887**) in view of JP 2000-187326 (**Imai '326**).

Applicants respectfully traverse this rejection.

Kubota '887 describes a method of forming a conductive pattern and manufacturing a ceramic multilayer board. **Imai '326** describes an ultraviolet sensitive positive resin composition and resist pattern forming method by using same.

Kubota '887 and **Imai '326**, alone or in combination, fail to describe, teach, or suggest the following features of claims 1, 7, and 13, as amended: "a method of forming a conductive pattern, comprising the steps of: ... applying a positive thermosensitive paste composition containing a conductive powder **and a heat-fusible inorganic powder** ... ; ... removing the irradiated part of

the coating by development to form a conductive pattern coating; and ... **calcining the conductive pattern coating**" in combination with the other claimed features.

Furthermore, in view of the experimental data presented in the enclosed Declaration, Applicants respectfully traverse this rejection.

Thus, Applicants respectfully submit that this rejection should be withdrawn.

E.

Claims 11, 12, 17, and 18 stand rejected under 35 USC 103(a) as obvious over **Kubota '887** in view of **Imai '326,** and JP 11-194493 (**Kosaka '493**), JP 10-334732 (**Masaki '732**), or JP 10-273338 (**Okino '338**).

Applicants respectfully traverse this rejection.

Kosaka '493 describes a photosensitive conductive paste. **Masaki '732** describes a photosensitive conductive paste and manufacture of electrode. **Okino '338** describes production of photosensitive electroconductive paste and electrode using the same.

Kubota '887, Imai '326, Kosaka '493, Masaki '732, and **Okino '338**, alone or in combination, fail to describe, teach, or suggest the following features of claims 1, 7, and 13, as amended: "a method of forming a conductive pattern, comprising the steps of: ... applying a positive thermosensitive paste composition containing a conductive powder **and a heat-fusible inorganic powder** ... ; ... removing the irradiated part of the coating by development to form a conductive pattern coating; and ... **calcining the conductive pattern coating**" in combination with the other claimed features.

Furthermore, in view of the experimental data presented in the enclosed Declaration, Applicants respectfully traverse this rejection.

Thus, Applicants respectfully submit that this rejection should be withdrawn.

F.

Claim 1 stands rejected under 35 USC 103(a) as obvious over **Kubota '887** in view of **Imai '326** and JP 06-260381 (**Yamanaka '381**).

Applicants respectfully traverse this rejection.

Yamanaka '381 describes a method for forming a resist pattern.

Kubota '887, **Imai '326**, and **Yamanaka '381**, alone or in combination, fail to describe, teach, or suggest the following features of claims 1, 7, and 13, as amended: "a method of forming a conductive pattern, comprising the steps of: ... applying a positive thermosensitive paste composition containing a conductive powder **and a heat-fusible inorganic powder** ... ; ... removing the irradiated part of the coating by development to form a conductive pattern coating; and ... **calcining the conductive pattern coating**" in combination with the other claimed features.

Furthermore, in view of the experimental data presented in the enclosed Declaration, Applicants respectfully traverse this rejection.

Thus, Applicants respectfully submit that this rejection should be withdrawn.

G.

Claims 5 and 6 stand rejected under 35 USC 103(a) as obvious over **Kubota '887** in view of **Imai '326** and **Yamanaka '381,** and **Kosaka '493**, **Masaki '732**, or **Okino '338**.

Applicants respectfully traverse this rejection.

Kubota '887, Imai '326, Yamanaka '381, Kosaka '493, Masaki '732, and **Okino '338**, alone or in combination, fail to describe, teach, or suggest the following features of claims 1, 7, and

13, as amended: "a method of forming a conductive pattern, comprising the steps of: ... applying a positive thermosensitive paste composition containing a conductive powder **and a heat-fusible inorganic powder** ... ; ... removing the irradiated part of the coating by development to form a conductive pattern coating; and ... **calcining the conductive pattern coating**" in combination with the other claimed features.

Furthermore, in view of the experimental data presented in the enclosed Declaration, Applicants respectfully traverse this rejection.

Thus, Applicants respectfully submit that this rejection should be withdrawn.

H.

Claims 19-21 stand rejected, as noted on page 1 of the Final Office Action dated January 23, 2004.

Applicants respectfully traverse this rejection.

The "Office Action Summary" on page 1 of the Final Office Action indicates that claims 19-21 stand rejected. However, no other portion of the Final Office Action explicitly discusses a rejection of claims 19-21. The Final Office Action does not clearly indicate whether the rejection

is based on 35 USC 103 or some other section of Title 35 of the United States Code. Also, the Final Office Action does not clearly indicate which art references are being combined to allegedly cause the subject matter of claims 19-21 to be obvious, if those claims are being rejected under 35 USC 103.

In view of telephone discussions with the Examiner, the Examiner might possibly have intended to reject claims 19-21 under 35 USC 103 as obvious over **Kubota '887**, **Imai '326**, and **Yamanaka '381**.

Although the Final Office Action dated January 23, 2004 does not fully address claims 19-21, Applicants desire to make a record as to why **Kubota '887**, **Imai '326**, and **Yamanaka '381** do not make them obvious, in the interest of speedy and compact prosecution, and otherwise indicate why they are patentable.

Kubota '887, **Imai '326**, and **Yamanaka '381**, alone or in combination, fail to describe, teach, or suggest the following features of claims 1, 7, and 13, as amended: "a method of forming a conductive pattern, comprising the steps of: ... applying a positive thermosensitive paste composition containing a conductive powder **and a heat-fusible inorganic powder** ... ; ... removing the irradiated part of the coating by development to form a conductive pattern coating; and ... **calcining the conductive pattern coating**" in combination with the other claimed features.

Furthermore, in view of the experimental data presented in the enclosed Declaration, Applicants respectfully traverse this rejection.

Thus, Applicants respectfully submit that this rejection should be withdrawn.

In view of the aforementioned amendments and accompanying remarks, claims 1, 6, 7, 12, 13, and 18-21, as amended, are in condition for allowance, which action, at an early date, is requested.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees that may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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PATENT TRADEMARK OFFICE

Enclosure: Declaration under 37 CFR 1.132

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Genji IMAI et al.

Serial No.: 09/988,252 Group Art Unit: 1762

Filed: November 19, 2001 Examiner: TALBOT, BRIAN K.

For: METHOD OF FORMING CONDUCTIVE PATTERN

DECLARATION

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir :

I, Genji IMAI, hereby declare that:

1) I am one of the inventors of the instant invention; and

2) The experiments given below were carried out under my general direction and supervision.

Experiments

(1) Experiment 1

A conductive pattern was formed in the same manner as in Example 5.

In particular, thermosensitive silver paste composition C prepared in Production Example 3 was applied to a transparent glass plate substrate and dried to form positive thermosensitive conductive coating C having a thickness of about 5 μm.

The surface of conductive coating C was exposed to direct irradiation with a 20,000 mJ/cm^2 infrared laser beam to form a pattern of line/space = 50 μm/100 μm, so that conductive coating C would be made into a desired electrode pattern when developed. Conductive coating C was then heated at 120°C for 10 minutes and developed by immersion in alkaline developer a (0.25 wt.% aqueous sodium carbonate) at 25°C for 60 seconds to remove the irradiated part.

The resulting conductive coating C was allowed to stand at 450°C for 30 minutes and calcined at 575°C for 30 minutes, giving a substrate having a strongly adhered patterned coating.

In the conductive pattern, the lines were well-remained and the spaces were also well-developed. The conductive pattern after calcination had a good line shape. Moreover, conductive coating C had a desirable volume resistivity not greater than 10^{-4} Ω·cm.

(2) Experiment 2

A positive thermosensitive resist coating having a thickness of about 5 μm was formed on a transparent glass plate substrate in the same manner as in Experiment 1 except that thermosensitive silver paste composition C was replaced with the 50 wt.% organic-solvent resist solution of Example 1 of JP 2000-187326. This 50 wt.% organic-solvent resist solution is identical to the 50 wt.% solution of the thermosensitive resin composition of

Production Example 3 of the present specification before adding a silver powder and a glass frit.

The surface of the resist coating was exposed to direct irradiation with a 20,000 mJ/cm^2 infrared laser beam to form a pattern of line/space = 50 μm/100 μm, so that the resist coating would be made into a desired electrode pattern when developed. The coating was then heated at 120°C for 10 minutes and developed by immersion in alkaline developer a at 25°C for 60 seconds to remove the irradiated part.

After standing at 450°C for 30 minutes and calcining at 575°C for 30 minutes, the resist coating had disappeared from the substrate.

Analysis

The positive thermosensitive paste composition for use in the method of the present invention is a paste prepared by adding a conductive powder and a heat-fusible inorganic powder (e.g., glass frit) to a positive energy-sensitive composition. It is essential to the method of forming a conductive pattern of the present invention to comprise the steps of applying the aforementioned positive thermosensitive paste composition to a substrate, irradiating the surface of a conductive coating prepared by drying the paste composition, and developing and calcining the conductive coating to form patterns. As evidenced by Experiment 1, a patterned coating is thereby formed on a substrate to which the coating strongly adheres. Moreover,

the lines are well-remained and the spaces are well-developed. The conductive pattern after calcination has a good line shape. Furthermore, the patterned coating has excellent conductivity.

In contrast, as evidenced by Experiment 2, when pattern formation is attempted using in place of the positive thermosensitive paste composition of the present invention the thermosensitive resist composition of JP 2000-187326, which contains neither a silver powder nor glass frit and is neither conductive nor in the form of a paste, the resist coating disappears from the substrate due to calcination, thereby failing to form patterns.

* * * * *

I, the undersigned, declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: June 14, 2004

Genji IMAI